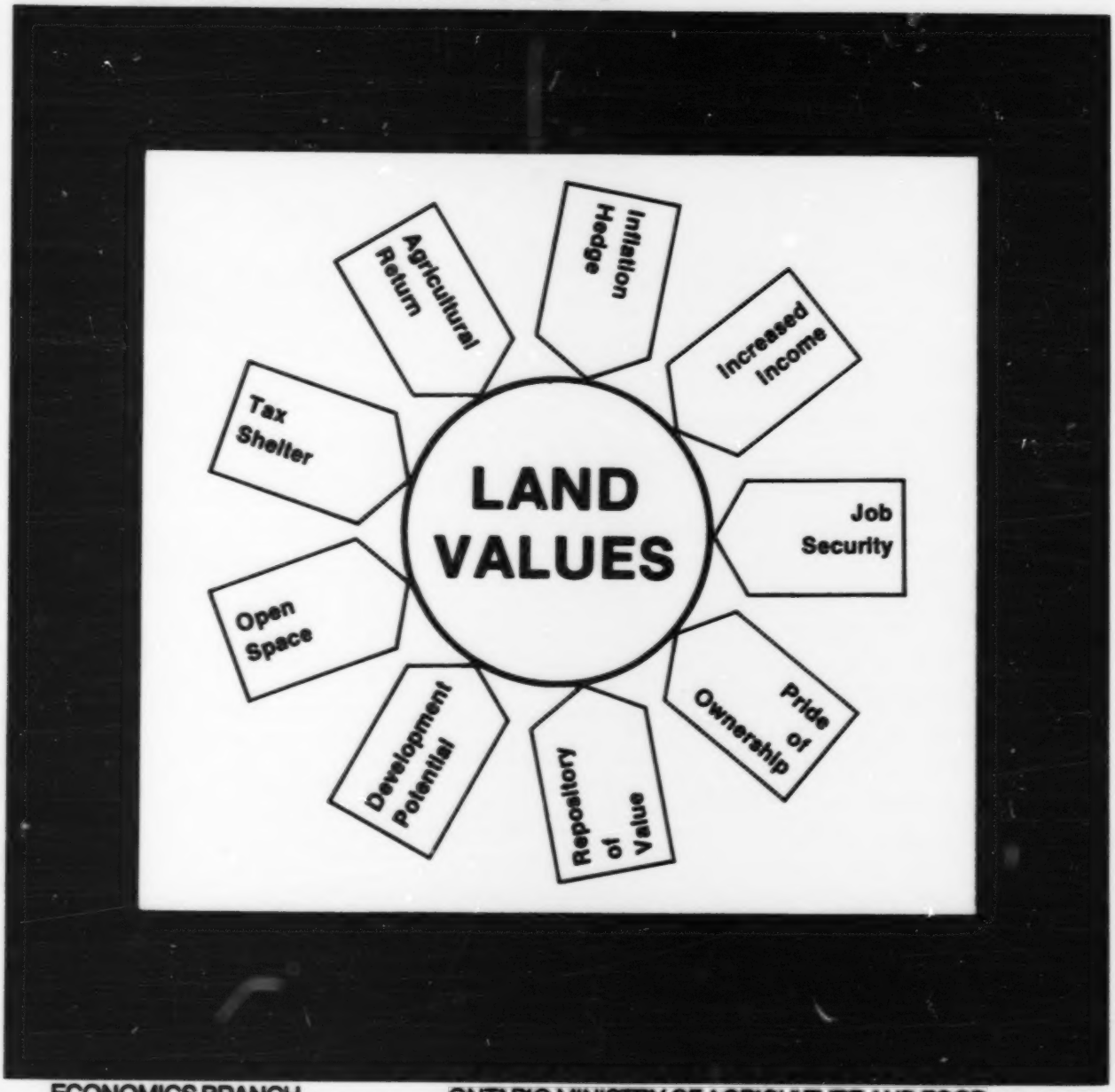
Ontario

Economic Research

A METHOD FOR DETERMINING ENTERPRISE LAND COSTS



ECONOMICS BRANCH

ONTARIO MINISTRY OF AGRICULTURE AND FOOD
LEGISLATIVE BUILDINGS, TORONTO, ONTARIO, M7A 1B6

ECONOMIC RESEARCH

A METHOD FOR DETERMINING ENTERPRISE LAND COSTS

by
Gordon E. Framst

Economics Branch
Ontario Ministry of Agriculture and Food
Legislative Buildings, Queen's Park
Toronto, Ontario M7A 1B6
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TABLE OF CONTENTS

	Page
INDEX TO TABLES	iii
INTRODUCTION	
Background to the Study	1
Problem Statement	1
Objectives of the Study	2
METHODS	
Evaluation of the Current Costing Method	2
Framework for Identifying and Selecting a New Method	3
ALTERNATIVES	
Identification	5
Evaluation	6
THE MODEL	
Specifications	6
Sources and Calculation	6
Application	9
RECOMMENDATIONS	
Selected Method	10
Further Research	10
BIBLIOGRAPHY	11

INDEX TO TABLES

TABLE	Page
1. Five-year Compound Rate Equivalents for Five-year Simple Average Inflation (Interest) Rates	8
2. A Comparison of Enterprise Land Costs Using Unadjusted and Adjusted FCC Interest Rates	9

INTRODUCTION

BACKGROUND TO THE STUDY

Land values have increased rapidly over the past few years. Data on farmer to farmer sales from the Assessment Branch, Ontario Ministry of Revenue indicate that land in Essex County which was selling for around $2,347 per hectare in 1976 was selling for around $6,180 in 1979. This is an increase of $3,833, or 163 percent in just three years. These increases coupled with increasing petroleum, fertilizer, and machinery costs are causing great concern in the agricultural industry, because current farm commodity prices have been insufficient to cover the costs of production.

If a farmer financed 75 percent of his land purchase with FCC at the current 14 percent interest rate, he would have an interest charge of nearly $650 per hectare in the first year. This cost alone is more than the average gross margin he could generate from producing corn. Or, looking at it another way, amortizing the entire land cost of $6,180 at 12 percent over 30 years, it would require the net returns from an additional two hectares of land (based on 1980 costs and prices) to pay for the purchase of one hectare of land. Many participants in the agricultural community, including farmers who do not have a land base large enough to generate the cash flow required to support their land purchases, would-be farmers with no land base, and farm organizations interested in maximizing farmers' incomes, support the use of full market values in cost of production determination and subsequent commodity price discussions. By implication, they are saying that agricultural income from selling the produce from one hectare of land should support the purchase of that one hectare.

Escalating land prices have likewise created problems with the Economics Branch, Ontario Ministry of Agriculture and Food (OMAF), method of handling land costs in calculating enterprise costs of production. The current costing method is to use an "agricultural" value based on farmer to farmer sales data and apply the FCC long term lending rate to this value. Using this method with present land prices and Farm Credit Corporation (FCC) interest rates consistently yields total costs in excess of gross revenue per hectare from the sale of agricultural produce. Users of the Economics Branch cost of production data generally agree with all but the land portion of the data. Some argue that the land prices used were too low, hence the total costs are too low. Others insist that farmers would not be buying land if the costs were really as high as shown in the cost data. Based on the premise that farmers are rational decision-makers, and the fact that they do continue to buy land at current land and commodity prices, it follows that there are factors other than income from agricultural production involved in land pricing decisions.

PROBLEM STATEMENT

The problem to be resolved in this study was strictly confined to finding a method of determining the land component of enterprise costs of production which was theoretically defensible and simple enough to be easily applied. Implicit in this statement is the notion that the calculated land portion of enterprise costs is only intended to be an estimate of the amount which should be charged against current income from agricultural production.

OBJECTIVES OF THE STUDY

The objectives of this paper were:

1. To review current land costing methods in Ontario and other jurisdictions.

2. To evaluate alternative costing methods with a view to improving OMAF enterprise costs of production procedures.

3. To recommend an improved cost of production methodology for land costing.

METHODS

EVALUATION OF THE CURRENT COSTING METHOD

A review of land costing methods used for enterprise cost of production work by a selection of other jurisdictions revealed a wide range of methods, and a general recognition that use of current market prices for land and interest creates problems. The U.S. Department of Agriculture reports to the U.S. Senate, on an annual basis, an estimate of the cost of producing 10 major U.S. crops (1,2). The 1979 report showed a composite land charge made up of ownership costs, share rent, and cash rent (2). This was calculated and shown in two different ways. The first was with ownership costs as current market price times the current Federal Land Bank interest rates, and rental costs at current rates. The second was calculated in the same way, except that average acquisition price was substituted for the current market price of land. The average acquisition price was a calculated 35 year average - based on the fact that approximately 3 percent of the farmland is sold each year.

Cost of production reports from the Canadian Prairies, and Quebec showed that the same basic principles have generally been applied in Canada as the U.S. Namely, a market price was determined for the land and this was multiplied by the prevailing agricultural land mortgage interest rate to arrive at a cost. This calculated cost was charged entirely to the enterprise under study (3,4). Variations on this theme included: differentiating between debt and equity (5), and using

average purchase price for land combined with mortgage interest rates existing at the time of purchase (6). A report by the B.C. Select Standing Committee on Agriculture (7) dealing with uses and misuses of cost of production information suggested that in some cases a "capitalization" rate of interest is used rather than the market rate. This "capitalization" rate discounts the current market interest rate to offset inflation in land prices.

Dr. John T. Scott, Jr., from the University of Illinois has explored the question of why farmers pay more for land than can be justified by capitalizing the net returns from agricultural production (8). He proposes a series of nine factors which he believes are the determinants of land prices. These factors are:

1. Agricultural return;
2. Increased income;
3. Inflation hedge;
4. Job security;
5. Pride of ownership;
6. Permanent repository of value;
7. Non-agricultural development potential;
8. Open space; and
9. Tax shelter.

The significance of any one of these price factors in determining the actual price paid for a given piece of land is subjective to the individual buyer. However, by using aggregate data, Scott capitalizes the first two factors--agricultural return and projected increased income to arrive at a price of $1,096 per acre. This was about one-third of what good quality land was then selling for in Illinois. He finally added in the third factor--inflation hedge--by using an estimated real rate of interest (3.2 percent) rather than the current mortgage rate (8.7 percent) as the discount factor. This brought the calculated land value up to $3,724 per acre, which was about 3 to 5 hundred dollars above the market price. Additional observations on several particular transactions led Scott to believe buyers were subjectively using a real interest rate of 4.0 percent to 4.5 percent, approximately 1 percent higher than the rate he had calculated. This was explained as an allowance for risk.

Randolph W. Ross's work at the Ridgetown College of Agricultural Technology in south-western Ontario supports Dr. Scott's thesis. Using a modified version of Dr. W.F. Lee's capital budgeting model (9), which includes factors for agricultural income, increased income, and inflation, Mr. Ross has calculated the maximum amount a farmer can justify paying for land with more than 120 individual farmers (10). The prices calculated have very closely approximated market prices. As in Scott's work, expected inflation accounted for one-half to two-thirds of the calculated price.

It is an accepted accounting principle that costs must be related directly to income resulting from those costs. Ross's and Scott's work clearly demonstrates that a major portion of the market price of land is brought about by expected inflation rather than the net income from the agricultural enterprise. If this principle is accepted, it is

incorrect to charge the full market price of land times the market interest rate against current income from the agricultural enterprise. The Economics Branch has been following this procedure but charging interest on the agricultural market value (which is somewhat less than the full market price). In this case, land costs are still being greatly overstated in Economics Branch enterprise cost of production estimates.

FRAMEWORK FOR IDENTIFYING AND SELECTING A NEW METHOD

Micro-economic theory suggests that the cost of a fixed factor of production such as land should be derived from its value in use. This implies calculating an "agricultural use-value", based on net returns to land, or alternatively, adjusting the interest rate used to reflect the agricultural use portion of market price. To maintain consistency with accounting principles, the agricultural use value should reflect only the price of current use. It should not include the capitalized value of expected increases in income due to new technology or increasing commodity prices. Thus, within the general framework of micro-economic theory, there are two principal factors to consider in choosing a costing method, value and interest rate.

Value. As indicated above, there are two general categories of value to be considered, agricultural use-value, and market price. Estimates of agricultural use-value tend to vary widely because the capitalization procedure is very sensitive to the subjective assumptions about future agricultural income, costs, and discount rates. Pasour (1979) reports this problem to be endemic in all use-value estimation procedures (11).

Market, or exchange prices tend to be much more objective phenomena, determined through the market process that is, if one can isolate bona fide, farmer to farmer, arms length sales that take place in predominantly agricultural areas. The Ontario Ministry of Agriculture and Food, Economics Branch is currently working with the Ontario Ministry of Revenue to develop such data for Ontario for 1979. It has been agreed that these data will be updated on an annual basis.

Market price data developed in this way are current market prices. Since the average date of purchase of lands used for a particular enterprise is always in the past, rapidly rising land prices ensure a wide discrepancy between purchase and current market prices. Both average purchase price and average current market price are being used to calculate enterprise costs of production. Purchase price is justified on the basis that it was the actual dollar investment in land. Current market price is justified on the basis of opportunity cost. Farmers could sell their land at current market prices and invest the money at current interest rates. This income is being foregone when farmers choose to produce a crop and is therefore the proper land cost.

While arguments are made supporting both purchase and current market price in cost of production calculations, it must be remembered that both are composite figures made up of the nine value factors proposed by Scott (8). Thus, whichever price is used, the specific

technique employed should be designed to charge only the cost of the current agricultural use components against the agricultural enterprise.

Interest rate. A review of the literature reveals four interest rates used or which might be used for determining the land component of costs of production:

1. The long term land mortgage rate;
2. The mortgage rate discounted for inflation;
3. The long term average rate of return to farm land; and
4. The individual time preference rate.

The long term mortgage rate is the most common rate used. In Canada, this is normally based on the Farm Credit Corporation (FCC) mortgage rates. The FCC interest rate is essentially market determined. Thus it contains elements of inflation, opportunity cost, time utility, and risk.

The inflation adjusted mortgage rate is determined by subtracting an estimated average inflation rate from the FCC mortgage rate to give a so-called "real interest rate". This effectively removes the inflation component of the interest rate, leaving the opportunity cost, risk, and other time preference factors.

The long term rate of return to the production assets (labor excluded) has been estimated by Professor E.C. Gray and B.E. Prentice at the University of Guelph (12). During the period 1969 to 1978, the rate of return has ranged between 2.0 percent and 4.7 percent, with an average of about 3.5 percent[1]. The method of calculation uses all production assets valued at current market price. The 3.5 percent rate is thus an estimate of the long term average agricultural return to the current price of all production assets. If machinery, equipment and building costs were taken out using the usual market interest rate, the residual return to land alone would obviously be lower than 3.5 percent.

The individual time preference rate is the rate at which Canadian investors are collectively indifferent between saving (investing) and current consumption. Jenkins, as reported by Southey, found the individual time preference rate in Canada to be very stable at about 4 percent (13). Since this rate was for the industrial as well as the agricultural sector, and since farmers have traditionally been more willing to defer current consumption than other sectors, one would expect the marginal time preference rate for farmers to be lower than 4 percent. By implication, a rate of return to farmers on agricultural production assets of something less than 4 percent of current value, would be adequate to maintain current levels of investment in agriculture.

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[1]These rates were calculated by reducing those reported by Gray and Prentice by 27.6 percent to allow for unpaid family labor.

Decision Criteria. The method chosen to calculate the land component of enterprise costs of production must be practically feasible, and should come as close as possible to measuring only those costs associated with the current agricultural return portion of land price.

ALTERNATIVES

IDENTIFICATION

The following alternative methods were identified or constructed from information contained in the previous section of the report.

1. Land rental rates.

2. Purchase price times:
   a. Inflation adjusted FCC rate
   b. Long term agricultural returns rate
   c. Time preference rate
   d. Current market interest rate (FCC rate)
3. Current market price times:
   a. Inflation adjusted FCC rate
   b. Long term agricultural returns rate
   c. Time preference rate
   d. Current market interest rate (FCC rate)

EVALUATION

Land rental rates. Current rental rates are an obvious best choice for enterprise costing, since they represent payment for only agricultural production rights. Historically, land rental has not been very popular in Ontario. Ownership has been the preferred and predominant means of controlling agricultural production rights. While this situation is changing, cash rental is still not felt to be common in many parts of the Province. Additionally, there is very little information available on rental rates. Consequently, the rental rates alternative cannot be adopted.

Purchase price. Average land purchase prices by enterprise are not readily available, making alternative 2 an unattractive choice. Although it would be possible to obtain such data through farmer surveys, it would be an expensive undertaking which should not be pursued if a viable alternative is available.

Current market price. These will be readily available on a county basis. To be a viable alternative, it must be combined with an interest rate which removes the inflation component but leaves the enterprise cost portion. The only interest rate of the four listed above which can satisfy these conditions is a, the inflation adjusted FCC rate. Removing the inflation component of the FCC rate leaves, principally, the agricultural income component. When the return from land inflation is low, the charge against the agricultural enterprise would be appropriately higher, and vice versa. This presents a problem

if the current land inflation rate is negative or if it approaches or exceeds the FCC interest rate. The use of a five-year average inflation rate would significantly reduce the chances of a negative rate occurring. It would also provide a measure of stability to the rate used for cost calculations. For cases where the land inflation rate approached or exceeded the FCC rate, it would be reasonable to impose a minimum charge against the enterprise for use of the land resource. Since the time preference rate and long term agricultural rate of return to agricultural land are both about 3.5 percent, this should be an acceptable minimum rate to set for enterprise costing.

THE MODEL

SPECIFICATION

$$ELC = Pc\ (Ifcc - INFc5)$$

subject to: $(Ifcc - INFc5) \geq 3.5$ percent

where:

ELC = enterprise land costs, taxes not included
Pc = current land price
Ifcc = Farm Credit Corporation lending rate
INFc5 = five-year average compound land inflation rate.

SOURCES AND CALCULATION

Pc — Land prices for 1979 by county and region will be published this summer (1981) by OMAF Economics Branch. These will be updated to 1980 when the sales data are available from the Ontario Ministry of Revenue. Since the price data may lag enterprise cost studies by a year, the prices can be updated by using the eastern Canada Farm Input Price Index.

Ifcc — Farm Credit Corporation mortgage rates are subject to change April 1 and October 1 each year. Information on rates is available from FCC and OMAF offices.

INFc5 — Ideally, the five year average compound rate of increase in land price would be calculated directly from land price data. Since these data are not available, the next best alternative is to use the "price of land and buildings" index for eastern Canada from Statistics Canada Farm Input Price Index (14). Using the price index, the five year annual compound rate of inflation can be calculated, by taking the fifth root of the ratio. Table 1 presents such compound rates equivalent to simple average rates. Note that this method discounts for all sources of inflation, thereby theoretically leaving only the current portion of land costs.

Table 1.--Five-year Compound Rate Equivalents for Five-year Simple Annual Average Inflation (Interest) Rates

Five-year Simple average rate, %	Five-year Compound equivalent rate, %
1.00	0.98
2.00	1.92
3.00	2.83
4.00	3.71
5.00	4.56
6.00	5.39
7.00	6.19
8.00	6.96
9.00	7.71
10.00	8.45
11.00	9.16
12.00	9.86
13.00	10.53
14.00	11.20
15.00	11.84
16.00	12.47
17.00	13.09
18.00	13.70
19.00	14.29
20.00	14.87
21.00	15.44
22.00	16.00
23.00	16.54
24.00	17.00
25.00	17.61
26.00	18.13
27.00	18.64
28.00	19.14
29.00	19.63
30.00	20.11

Example: The "Land and Buildings Value" indices for 1974 and 1979 were 160.1 and 327.7 respectively. The simple average rate of inflation was therefore (327.7/160.1 - 1) x 100/5 = 20.94. From Table 1, the equivalent compound rate was 15.4 percent.

APPLICATION

Table 2 shows a comparison of enterprise land investment costs for the current method (market price times FCC rate) and the proposed method (market price times adjusted FCC rate). The data are from selected 1979 Farm Business Management Handbook enterprise costs of production.

Table 2.--A Comparison of Enterprise Land Costs Using Unadjusted and Adjusted FCC Interest Rates

Enterprise	Land price[a]	Ifcc	Enterprise land cost	Adjusted Ifcc[b]	Adjusted land cost	Difference
	$/ha	%	$/ha	%	$/ha	$/ha
Grain Corn, Soybeans, S. Ont.	2,200	10.8	237.60	3.5	77	160.60
Barley, Lambton, Huron	1,100	10.8	118.80	3.5	38.50	80.30
Celery, Lettuce, Cabbage, Cauliflower, Bradford Marsh	7,413	10.8	800.60	3.5	259.50	541.10
Cherries, Niagara	9,884	10.8	1,067.47	3.5	345.94	721.53
Bartlett Pears, Niagara	8,154	10.8	880.63	3.5	285.39	595.24
Grapes, Niagara	8,648	10.8	933.98	3.5	302.68	631.30

[a]Land prices used in the Farm Business Management Handbook had not been updated since 1978. Thus the prices shown here will likely be lower than actual 1979 market prices.

[b]$INFc5 = 15.4$ (see example following Table 1). Since $(Ifcc - INFc5) < 3.5$, the default value of 3.5 percent is used.

RECOMMENDATIONS

SELECTED METHOD

Alternative 3a meets all the theoretical and practical criteria set out for selecting an enterprise land costing method. It effectively removes the speculative component of farmland investment while retaining a reasonable minimum contribution from the agricultural enterprise. Equally important, the method is relatively easy to apply. This method is therefore recommended for immediate adoption in all Economics Branch enterprise cost of production work.

In brief, the method is as follows:

Enterprise land cost = current market price X (Farm Credit Corporation mortgage rate - the five-year annual average compound rate of land inflation).

This rate (in brackets) subject to a 3.5 percent minimum.

FURTHER RESEARCH

Two important areas for further research are evident from this study; land rental rates, and capital structure.

Land rental. It has been suggested by Randolph Ross, Ridgetown College of Agricultural Technology, that cash rental is becoming fairly significant in south-western Ontario. He also suggests that these rental rates are about 3.5 percent of current market value. As stated previously in this report, rental rates are the best measure of enterprise land costs. However, before they can be used more information must be available. How prevalent is land rental in Ontario, what are the rental rates, and what are the terms and conditions?

Capital structure. If it takes the net income from three hectares to amortize the purchase of one hectare over the life of a farmer, where will that extra money come from? Will existing farmers buy all the land offered for sale? Will outside capital move into agriculture? How will intergeneration transfers be affected? Who will own Ontario's farm land 50 years from now? Research into this area is long overdue.

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